Dr A C Beynen was professor of veterinary nutrition at the Faculty of Veterinary Medicine, Utrecht University, The Netherlands in the period of 1993-2007.

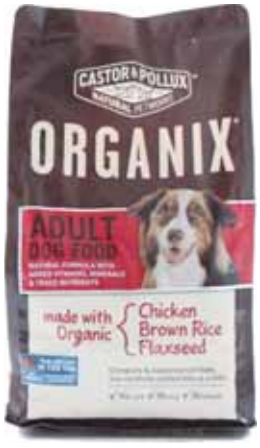
Flax in dog food

Flax is a plant grown mainly for its oil and occasionally as linen-fiber crop. Flaxseeds, also known as linseeds, are small, flat and oval-shaped. Flaxseed or its oil component is found in the ingredient lists of many commercial dog foods. Dry foods may contain up to 10% flaxseed or 4% flaxseed oil. Flaxseed meal (defatted seeds) is scarcely used.

Alpha-linolenic acid (ALA), an omega-3 fatty acid, is an essential nutrient that must be present in the diet. Various ingredients provide ALA, but flaxseed (oil) has a uniquely rich content. The dog can convert ALA into EPA (eicosapentaenoic acid), which elicits biological activity. The conversion forms the basis for claims that flaxseed (oil) supports healthy skin, hair coat, joints and heart, but these enhancements are unproven for flaxseed incorporated into an ALA-sufficient diet. Supplemental flaxseed oil may ameliorate inflammatory skin disease.

Some internet discussions convey the impression that flaxseed causes food allergy. A manufacturer offers a dog food line with an explicit flax-free claim. In fact, canine food allergy is rare (1), rendering flaxseed allergy exceptionally rare. Another concern is that dietary flax releases potentially toxic cyanide. No adverse cyanide-related effects have been reported for practical flaxseed-containing dog diets, but this status quo awaits controlled study for confirmation.

Flaxseed is high in lignans, compounds that can imitate or oppose female sex hormone activity. Some dog breeders use flaxseed supplements for reproductive health (2). In female rats, dietary flaxseed altered reproductive development and reduced the risk of chemical-induced breast cancer. These topics are still unaddressed in dogs. Flaxseed-containing dog foods might affect long-term health positively or negatively. For now, flaxseed (oil) is a suitable, but dispensable ingredient.



Composition

The approximate composition of whole flaxseed is 36% crude fat, 22% crude protein, 8% crude fiber, 4% ash and 8% moisture. The specialities, ALA and secoisolariciresinol diglucoside (SDG), constitute about 20 and 1%. Total SDG (3) consists of various oligomers (4). Measurable amounts of undesired cyanogenic glucosides, tannins and seed-coat mucilage fall markedly upon heat treatment (5, 6) such as applied in the production of kibbled or canned food.

Flaxseeds have a tough hull. Human subjects consuming muffins with identical amounts of ALA as whole flaxseed, milled seed or flax oil, had increasing plasma ALA concentrations, in this order (7). Grinding seeds or isolating oil enhances ALA availability, but also its oxidation susceptibility. In stored oil, oxidation (8) and bitter products (9) appear.

Digestibility

Incorporating flaxseed, presumably ground and at 5.6%, into an extruded food, without changing macronutrient composition, lowered apparent protein and fat digestibility in dogs by about one percent unit, while fecal moisture was unaffected (10). Flaxseed fermentation by canine fecal flora gave uninterpretable results (11).

Solvent-extracted flaxseed meal, as component of extruded kibbles, had an apparent protein digestibility of 79% (12). It was 77% for pressed flaxseed cake, soaked in hot water and then mixed with wetted kibbles (13). Intake of dietary dry matter with 1% flaxseed mucilage, which matches about 9% whole flaxseed (6, 14, 15), resulted in lower fat digestibility and more moist stools (16).

Alpha-linolenic acid

Feeding ground flaxseed or flax oil to dogs raises ALA, EPA and docosapentaenoic acid (DPA), but not (docosahexaenoic acid) DHA, in blood total lipids, phospholipids, triglycerides, erythrocytes, neutrophils, and heart tissue (17-22). ALA intakes were increased up to 6.5 g per MJ metabolizable energy for at least 4 weeks.

The fatty acid changes endorse that the dog is capable of converting ALA. The liver desaturates both linoleic acid (LA) and ALA (23), releases arachidonic acid (24) and likely EPA and DPA also. Canine retina and brain functionality requires DHA, plasma DPA serving as (co-)precursor (25). Milk fat from dogs fed flax oil during gestation and lactation was enriched in ALA, but not in EPA, DPA and DHA (26).

Eicosapentaenoic acid

EPA gives rise to eicosanoids with wide-ranging biological properties. Dogs gather bodily EPA more efficiently from dietary EPA than from ALA (22) or ALA's delta-6-desaturase product, stearidonic acid (27). Using the observed (22) build-up of plasma phospholipid EPA as criterion, it follows that 1.5 g of flaxseed oil (55% ALA) is as effective as 1 g of fish oil (10% EPA).

Skin health

Increasing the dietary ALA level from 0.08 g/MJ, which met the dog's requirement (28), to 0.56 g/MJ by inclusion of ground flaxseed, did not affect skin and hair coat condition in healthy dogs (29-31). Supplemental flaxseed oil (0.44 g ALA/MJ) improved canine atopic dermatitis somewhat less than pure EPA (0.20 g/MJ) (32), while EPA amounted to twice the maximum effective dose (33).

Heart and joint health

Fish oil (0.13 g EPA/MJ), but not flax oil (0.17 g ALA/MJ) supplementation, distinctly elevated group-mean plasma EPA and reduced ventricular arrhythmia in Boxers (34). Fish oil (0.2-0.4 g EPA/MJ) has a small beneficial impact on canine osteoarthritis (35), but flax oil's position remains unknown.

Cancer

In specific rat studies (36, 37), flaxseed mitigated cancer risk. Exposure to a diet with 10% ground flaxseed or 0.02% SDG during suckling, reduced the incidence of dimetylbenzanthracene-induced palpable mammary tumors later in life (37).

Reproductive development

Dietary flaxseed activated oestrogen-receptor signaling in murine mammary gland (38). Diets containing 5 or 10% flaxseed delayed or accelerated puberty onset in female rats (39, 40).

List of references is available on request from the author (beynen@freeler.nl)

** Dr Anton C Beynen writes this exclusive column on dog and cat nutrition every month. He is affiliated with Vobra Special Petfoods.*